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Egg Yolk Pigmentation as Influenced by Alfalfa Meal and Various Concentrates

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This study was a continuation of testing natural and synthetic materials in the production of deeply pigmented egg yolk. Thus far β-apo 8' carotenoic acid ethyl ester (BACE) has been the most efficient pigmenter used, followed by β-apo 8' carotenal (BAC) and then various alfalfa concentrates, alfalfa or corn gluten meal and marigold meals. There has been a tendency for enhanced yolk color when the synthetic pigmenters were fed with alfalfa, suggesting synergism. This study was therefore conducted to determine if fractions of alfalfa meal with little or no xanthophyll would enhance the utilization of pure pigmenting material.

Caged hens, depleted of pigment on milo-soy diets, were fed as shown in Table 1. The alfalfa residue was obtained by extracting pigments from a sample of 17% protein alfalfa meal. Next, the extract was eluted from a column which retained the pigments. Each portion of eluate and residue was divided, half of each being added to 30 kg of basal, forming diets 2 and 3. Similarly, BAC was added to the remaining portions of eluate and residue and incorporated in diets 4 and 6. The other diets were formed by adding the indicated amounts to the basal. Results were scored by chemical determinations, expressed as micrograms β-carotene equivalents (BCE) per gram of yolk.

In part I, yolks produced with the basal, eluate, and residue diets were very low in pigment (BCE) and within the range expected from the basal diet. The BCE yolk value for diet 4 (eluate + BAC) was lower than for diet 6 (residue + BAC), indicating that the eluate depressed the pigment value while the residue enhanced the value. Although the BCE value of diet 5 (BAC) was intermediate, the difference between diet 4 (eluate + BAC) and diet 6 (residue + BAC) was statistically significant.

In part II, the BCE values of the natural sources of pigment were considerably below the values of the synthetic and combinations of natural plus synthetic pigments. Yolk pigmentation was enhanced more than expected when any of the pigmenters were fed with alfalfa.

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Table 1. Pigmentation of Egg Yolk Produced by Various Diet Additions

Treatments	BCE[1]/gm yolk
Part I	
Basal milo	1.4a[4]
Basal + alfalfa eluate (≃ 10% Alfalfa)	1.9a
Basal + alfalfa residue (≃ 10% Alfalfa)	5.2a
Basal + alfalfa eluate + 20 ppm BAC[2]	29.8b
Basal + 20 ppm BAC	35.4bc
Basal + alfalfa residue + 20 ppm BAC	38.2c
Part II	
Basal + 20 ppm marigold xanthophyll	23.9
Basal + 10% alfalfa	28.8
Basal + 10% alfalfa + 20 ppm BAC	49.2
Basal + alfalfa + marigold	54.5
Basal + 20 ppm BACE[3]	59.2
Basal + 10% alfalfa + 20 ppm BACE	93.4

[1]β-carotene equivalents in micrograms.
[2]β-apo 8' carotenal.
[3]β-apo 8' carotenoic acid.
[4]Data followed by unlike letters are different at the 0.05 level of significance.